

We Claim:

- 1 1. A golf club comprising in combination a golf head and a golf shaft for providing a an
2 overall light weight golf club having a swingweight similar to a typical steel shafted golf
3 club, the light weight golf club comprising:
4 a light weight golf shaft having a high swingweight comprising a primarily non-
5 metal golf shaft having a weighting plug selected from a plurality of
6 weighting plugs, a handle portion, and an end opposite the handle portion,
7 and
8 the golf head receiving the end.
- 1 2. The golf club of claim 1, wherein the weighting plug further comprises a variable
2 density plug.
- 1 3. The golf club of claim 1 wherein the plug material comprises carbon fiber reinforced
2 polycarbonate.
- 1 4. The golf club of claim 1 wherein the plug is one of a variety of plugs ranging in weight
2 by 50% relative to a minimum plug weight.
- 1 5. The golf club of claim 4 wherein the variety of plugs incorporate different density
2 materials from the group comprising: tungsten, copper, and iron; whereby a variety of
3 weights is provided.



1 6. The golf club of claim 5 wherein a plug material is resinous and the different density
2 materials are added thereto.

1 7. The golf club of claim 1 wherein the plug is fixed in the end of the golf shaft opposite
2 the handle portion of the golf shaft to simultaneously provide weight and close a hole in
3 the end of the golf shaft.

1 8. The golf club of claim 1 wherein an increase in weight due to the plug provides a
2 balance point closer to said end, whereby the swingweight is increased.

1 9. The golf club of claim 1 wherein the plug and golf shaft form a one piece composite.

1 10. The golf club of claim 1 wherein the plug is configured to be detachably supported
2 on a mandrel; the golf shaft is formed of thin layers of prepreg composite material
3 windings which overlap and fix the plug to the golf shaft; and wherein the golf head is
4 from the group of materials comprising wood, metal, plastic, and composites.

1 11. A method of using a golf club that is lighter than a typical steel shafted golf club, the
2 lighter golf club having been weighted such that the lighter golf club swingweight is
3 similar to that of the typical steel shafted golf club, the method of using comprising
4 swinging the lighter golf club with similar forces to those applied when swinging the
5 steel shafted golf club; wherein a feeling of opposite forces on the hands of a user

6 during acceleration of the lighter golf club is the same as the feeling that would be felt
7 when using the steel shafted golf club.

1 12. A light weight golf club with a high swingweight comprising:

2 a golf shaft and a golf head;

3 wherein the golf shaft is made light and to have the high swingweight by the
4 process of:

5 impregnating a resin with high density material,

6 molding the resin into a plug,

7 attaching the plug to the golf shaft;

8 wherein the impregnated resin has a higher density than a non-impregnated
9 resin.

1 13. A light weight golf shaft having a high swingweight , the golf shaft comprising a
2 weighting plug selected from a plurality of weighting plugs.

1 14. The golf shaft of claim 13 wherein the weighting plug comprises a variable density
2 plug.

1 15. The golf shaft of claim 13 wherein the plug material comprises carbon fiber
2 reinforced polycarbonate.

1 16. The golf shaft of claim 13 wherein the plug is one of a variety of plugs ranging in
2 weight by 50% relative to a minimum plug weight.



1 17. The golf shaft of claim 16 wherein the variety of plugs incorporates different density
2 materials from the group comprising: tungsten, copper, and iron; whereby a variety of
3 weights is provided.

1 18. The golf shaft of claim 17 wherein a plug material is resinous and the different
2 density materials are added thereto.

1 19. The golf shaft of claim 13 wherein the plug is fixed in an end of the golf shaft
2 opposite a handle portion of the golf shaft to simultaneously provide weight and close a
3 hole in the end of the golf shaft.

1 20. The golf shaft of claim 13 wherein an increase in weight due to the plug provides a
2 balance point closer to said end, whereby the swingweight is increased.

1 21. The golf shaft of claim 13 wherein the plug and golf shaft form a one piece
2 composite.

1 22. The golf shaft of claim 13 wherein the plug is configured to be detachably supported
2 on a mandrel; and the golf shaft is formed of thin layers of prepreg composite material
3 windings which overlap and fix the plug to the golf shaft.

1 23. A golf shaft with a high swingweight comprising:
2 a golf shaft;

wherein the golf shaft is made light and to have the high swingweight by the
process of:

impregnating a resin with high density material,
molding the resin into a plug,
attaching the plug to the golf shaft;

wherein the impregnated resin has a higher density than a non-impregnated
resin.

24. A method of making a light weight golf club for reducing the overall weight of the golf
club while providing a swingweight similar to that of a typical steel shafted golf club, the
method comprising the steps of:

(a) providing a light weight golf shaft with a weighting plug selected from a
plurality of weighting plugs, and
(b) attaching a golf head to the golf shaft.

25. The method of claim 24 and further comprising the step of weighting the plug.

26. The method of claim 24 comprising forming the plug and golf shaft into a one piece
composite member.

27. The method of claim 24 wherein making the light weight golf club comprises making
a light weight golf shaft with a swingweight of a typical steel golf shaft, the method
further comprising:



- 4 (a) forming the golf shaft of composite plastic materials of total mass less than
5 100g,
6 (b) positioning a balance point of the light weight golf shaft such that the force
7 required for a particular swing acceleration is substantially equivalent to a
8 force required for the same swing acceleration of the typical steel golf shaft
9 having a total mass of over 100g.

1 28. The method of claim 27 wherein the step of positioning further includes the step of
2 selectively attaching a plug of a specific weight to the light weight golf shaft, said weight
3 depending on a predetermined length of the golf club for enhancing playability of a set
4 of golf clubs thus made.

1 29. The method of claim 24 and further comprising the step of filling a hole in a tip end
2 of the golf shaft simultaneously with the step of providing the weighting plug by filling the
3 hole with the plug.

1 30. The method of claim 24, the steps further comprising the step of selectively varying
2 the weight of the plug by up to 50% relative to a minimum plug weight.

1 31. The method of claim 24, the steps further comprising the step of selectively
2 choosing the golf head and plug based on a selection of plugs varying in weight by 50%
3 relative to a minimum plug weight.

- 1 32. The method of claim 24 wherein the step of providing the light weight golf shaft
2 further comprises:
3 (a) forming the weighting plug,
4 (b) locating the balance point further from a handle portion of the light weight
5 golf shaft by incorporating the plug as an integral part of an end of the light
6 weight golf shaft opposite the handle portion.
- 1 33. The method of claim 32 and further comprising the step of selectively locating the
2 balance point away from the handle portion of the composite golf shaft by selectively
3 adding a dense material to the plug.
- 1 34. The method of claim 33 wherein the dense material is selected from the group of
2 different density materials comprising: tungsten, copper, and iron.
- 1 35. The method of claim 33 wherein the plug is formed of a moldable resin and further
2 including the step of adding the dense material to the resin.
- 1 36. The method of claim 35 wherein the dense material is selected from the group of
2 different density materials comprising: tungsten, copper, and iron.
- 1 37. The method of claim 32 comprising forming the plug and golf shaft into a one piece
2 composite member.

1 38. The method of claim 32 and further including the steps of:

- 2 (a) molding an end of the plug such that it can be removably supported on a
3 mandrel,
4 (b) mounting the plug on the mandrel,
5 (c) forming the golf shaft and fixing the golf shaft to the plug by rolling thin
6 layers of prepreg composite materials onto the mandrel and plug in a
7 predetermined order,
8 (d) wrapping the mandrel, composite materials, and plug with thin cellophane
9 or polypropylene,
10 (e) hardening and curing the golf shaft by heating, and
11 (f) removing the golf shaft with the plug from the mandrel;

12 wherein the composite layers form the golf shaft and wherein the plug is made integral
13 by the wrapping and curing steps.

1 39. A method of making a light weight golf shaft with a swingweight of a typical steel golf
2 shaft, the method comprising:

- 3 (a) providing a light weight golf shaft with a weighting plug selected from a
4 plurality of weighting plugs.

1 40. The method of claim 39 and further comprising the step of weighting the plug.

1 41. The method of claim 39 comprising forming the plug and golf shaft into a one piece
2 composite member.

1 42. The method of claim 39 comprising:

2 (a) forming the golf shaft of composite plastic materials of total mass less than
3 100g,

4 (b) positioning a balance point of the light weight golf shaft such that the force
5 required for a particular swing acceleration is substantially equivalent to a
6 force required for the same swing acceleration of the typical steel golf shaft
7 having a total mass of over 100g.

1 43. The method of claim 42 wherein the step of positioning further includes the step of
2 selectively attaching a plug of a specific weight to the light weight golf shaft.

1 44. The method of claim 39 and further comprising the step of filling a hole in a tip end
2 of the light weight golf shaft simultaneously with the step of providing the weighting plug
3 by filling the hole with the plug.

1 45. The method of claim 39, further comprising the step of selectively varying the weight
2 of the plug by 50% relative to a minimum plug weight.

1 46. The method of claim 39 wherein the step further comprises:

2 (a) forming the weighting plug,

3 (b) locating the balance point further from a handle portion of the light weight
4 golf shaft by incorporating the plug as an integral part of an end of the light
5 weight golf shaft opposite the handle portion.

1 47. The method of claim 46 and further comprising the step of selectively locating the
2 balance point away from the handle portion of the composite golf shaft by selectively
3 adding a dense material to the plug.

1 48. The method of claim 47 wherein the dense material is selected from the group of
2 different density materials comprising: tungsten, copper, and iron.

1 49. The method of claim 47 wherein the plug is formed of a moldable resin and further
2 including the step of adding the dense material to the resin.

1 50. The method of claim 49 wherein the dense material is selected from the group of
2 different density materials comprising: tungsten, copper, and iron.

1 51. The method of claim 46 comprising forming the plug and golf shaft into a one piece
2 composite member.

1 52. The method of claim 46 and further including the steps of:

2 (a) molding an end of the plug such that it can be removably supported on a
3 mandrel,

4 (b) mounting the plug on the mandrel,

5 (c) forming the golf shaft and fixing the golf shaft to the plug by rolling thin
6 layers of prepreg composite materials onto the mandrel and plug in a
7 predetermined order,

- 8 (d) wrapping the mandrel, composite materials, and plug with thin cellophane
9 or polypropylene,
10 (e) hardening and curing the golf shaft by heating, and
11 (f) removing the golf shaft with the plug from the mandrel;
12 wherein the composite layers form the golf shaft and wherein the plug is made integral
13 by the wrapping and curing steps.

1 53. A set of golf clubs wherein each club comprises a weighting plug selected from a
2 plurality of weighting plugs having a variety of weights; whereby the set of golf clubs has
3 enhanced playability.

1 54. A set of golf shafts wherein each golf shaft comprises a weighting plug selected
2 from a plurality of weighting plugs having a variety of weights; whereby a set of golf
3 clubs made from said set of shafts has enhanced playability.

1 55. Method of making a set of golf clubs comprising:
2 (a) selecting weighting plugs from a plurality of weighting plugs having a
3 variety of weights,
4 (b) providing one of said weighting plugs on each golf club of the set;
5 whereby the set of golf clubs has enhanced playability.

1 56. Method of making a set of golf shafts comprising:
2 (a) selecting weighting plugs from a plurality of weighting plugs having a
3 variety of weights,

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